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Smart Helmet using Gpstracking for Two Wheeler

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ABSTRACT

Accidents are increasing day by day; also, there are many laws and regulations posed by the government to avoid these road accidents.Accidents are not a planned events but it may leads to injury or even to death. The accidents that occur in two-wheelers are more compared to other vehicles[1]. Even though, road rules and regulations are framed by the government to avoid accidents, the rate of accidents is increasing day by day. This may be avoided riding vehicles riding vehicles by wearing helmets. However, wearing a helmet can reduce the risk of accidents majorly. This smart helmet system provides safety to the rider most effectively and technologically using the Internet of Things (IoT) has been implemented for accident prevention, accident detection, and also a quick GPS location recovery system. This proposal also helps to understand IoT technology that is emerging nowadays. The method proposed uses Arduino Nano, and other cost-effective sensors like an IR sensor. The bike engine will start only when the rider wears the helmet. It detects the bike rider's head within certain range. A Radio Frequency (RF) Module is used for wireless communication between the helmet unit as transmitter and the bike unit as receiver. Ultrasonic sensors are used to detect nearby approaching vehicles and send voice alerts to riders by speakers, the Most important utility of this method is that fall detection using a Vibrator Sensor and GSM & GPS module system is included so that emergency medical service can easily track the location of the incident occurs and also sending SMS message alert to the emergency number of the rider stored. Smart helmet system helps to find accident detection, safety, and security to the two-wheeler riders.

Keywords: Arduino Nano, GPS, GSM, RF module, MQ3, ADXL345,

INTRODUCTION

Bike riding is fun, but accidents can happen. Many people prefer motorcycles to cars because they are cheaper to operate, easier to repair and park, and more flexible in traffic[2]. In India, over 37 million people use two-wheelers. Since the number of users is high, the accident rate for two-wheelers is also higher compared to four-wheelers. Motorcycles have a higher rate of fatal accidents than cars, trucks, or buses[3]. This project concentrates on prevention of accidents, safety for bike riders.The main goal is to promote wearing helmets. The system ensures that the bike will only start if the rider is wearing a helmet and has not consumed alcohol. So, alcohol detection is also a key feature. The system will also alert the rider if any obstacle gets too close while riding, which is especially useful at night or when the rider is tired or drowsy.

This can help prevent accidents. GSM technology is used to notify family members if an accident occurs. Accident detection is done using an accelerometer. There is wireless communication between the helmet and the bike using the ASK module. The smart helmet is specially designed for safe motorcycle riding. It has the features to show the rider their speed and location. . Tamil Nadu State has made that Wearing helmets is mandatory. Traffic accidents in India have been increasing every year. According to Section 129 of the Motor Vehicles Act, 1988, all two-wheeler riders must wear helmets that meet BIS (Bureau of Indian Standards) norms. Also, drunk driving is a criminal offense under the Motor Vehicle Act of 1939, and the rider can be punished. Currently, many bike riders easily avoid these rules. These three major issues—not wearing helmets, drunk driving, and lack of quick medical help after accidents—motivated the creation of this project. Helmet Detection: The first step is to check if the helmet is being worn. If yes, the ignition will start.

Otherwise, it stays off. This is done using an Infrared (IR) sensor. Alcohol Detection: The second step uses an alcohol sensor to check the rider's breathe. If the alcohol level is above the safe limit, the ignition will not start. A message is sent saying, "Rider is drunk and trying to ride the bike. "Accident Detection: If an accident happens, medical help might be delayed, which can be fatal. An accelerometer in the bike helps detect accidents. This project aims to construct system to protect two wheeler rider within the helmet which increase the safety.

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SMART HELMET

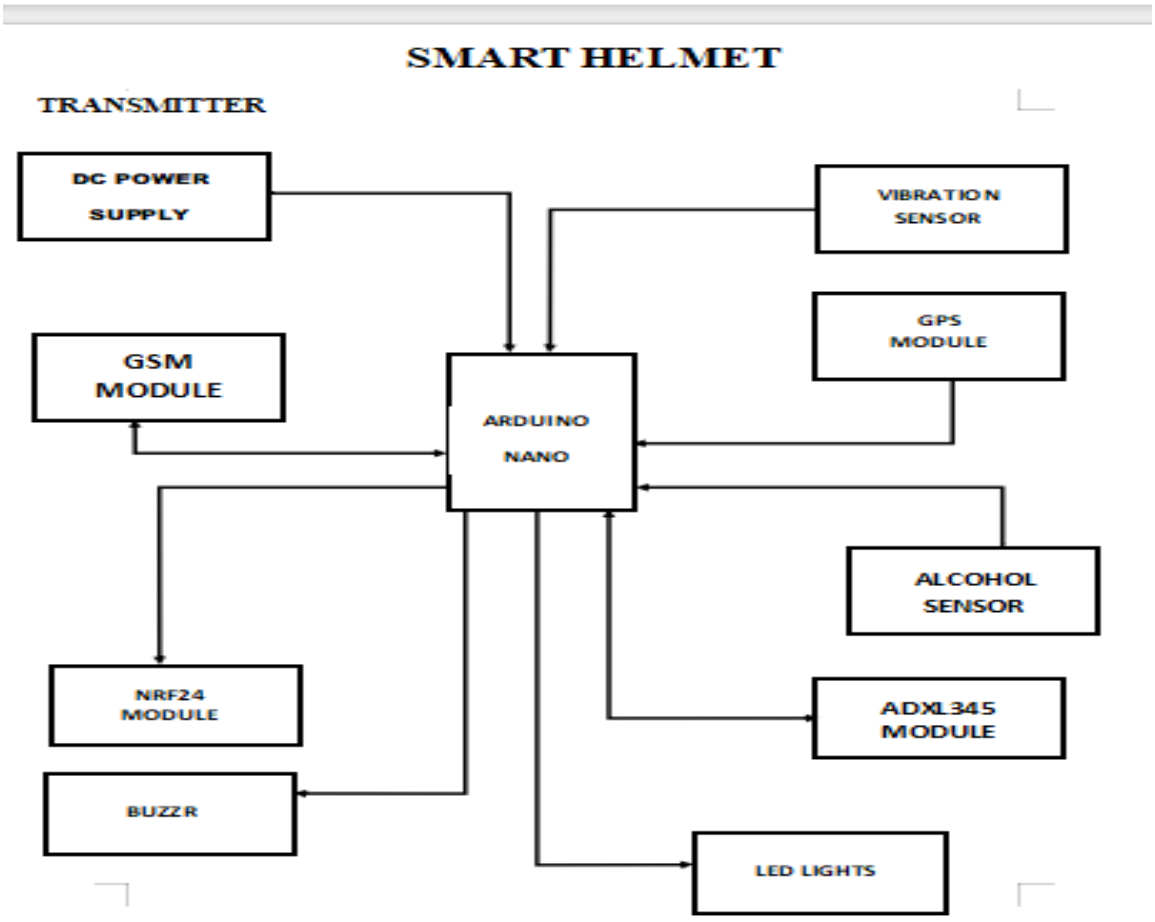
EXISTING SYSTEM

- Accident detection.
- MQ-3 Gas sensor.
- Bluetooth Transmitter and Receiver.
- GPS Neo 6m.
- GSM SIM800L Modu

PROPOSING SYSTEM

In recent times helmets have been made compulsory in Tamil Nadu State. Traffic accidents in India have increased every year. As per Section 129 of the Motor Vehicles Act, 1988, every single person riding a two-wheeler is required to wear protective headgear following the standards of BIS (Bureau of Indian Standards). Also, drunken driving under the influence (DUI) is a criminal offense according to the Motor Vehicle Act 1939, which states that the bike rider will get punishment. Currently, bike riders easily escape from the law. These are the three main issues that motivated us to develop this project. The first step is to identify whether the helmet is worn or not. If the helmet is worn then the ignition will start otherwise it remains off. For this, a Force Sensing Sensor is used. The second step is alcohol detection. An alcohol sensor is used as a breath analyzer which detects the presence of alcohol in the rider's breath and if it exceeds the permissible limit ignition cannot start. It will send a message to the number saying that the "Rider is drunk and is trying to ride the bike". MQ-3 sensor is used for this purpose. Only the ignition starts only when the two conditions are satisfied. The third main issue is accident and late medical help. If the rider has met with an accident, he may not receive medical help instantly, which is one of the main reasons for death. Every second people die due to delays in medical assistance, or in the case where the place of accident is unmanned.In fall detection, we add a device, an accelerometer in the bike unit. By this mechanism, accidents can be detected. This project aims to make à protection system in a helmet for the safety of bike riders.

BLACK DIAGRAM



Transmeter

The Smart Helmet system is an innovative safety device that integrates multiple sensors and communication modules to enhance rider safety and monitoring. At the core of the system is the Arduino Nano, which coordinates input from several components. A vibration sensor detects impacts or sudden movements, while a GPS module provides real-time location tracking.

An alcohol sensor monitors the rider's breath to detect alcohol consumption, and the ADXL345 module is used for tilt and motion sensing.A DC power supply ensures the system is adequately powered. The helmet also includes a GSM module for mobile communication, allowing alerts or data to be sent remotely, and an NRF24 module for short-range wireless communication. A buzzer provides audible warnings or alerts, and LED lights are used for visual notifications or illumination. This integrated system aims to provide enhanced safety, real-time monitoring, and emergency response capabilities for motorcycle riders.

The Smart Helmet is an advanced safety system designed to provide comprehensive monitoring and protection for motorcycle riders through the integration of multiple sensors and communication modules, all centered around the Arduino Nano microcontroller. This system utilizes a DC power supply to power the various electronic components connected to the helmet.A vibration sensor is incorporated to detect any sudden impacts or collisions, which could indicate an accident. Complementing this is the GPS module, which continuously tracks the real-time location of the rider, allowing for immediate location sharing in case of emergencies.

To enhance safety further, the helmet is equipped with an alcohol sensor that detects the presence of alcohol in the rider’s breath, preventing intoxicated individuals from riding. The ADXL345 accelerometer module is used to monitor the tilt and motion of the helmet, which can help in identifying falls or abnormal riding behavior For communication, the system includes a GSM module that facilitates long-range data transmission and alerts via mobile networks and an NRF24 module that supports short-range wireless communication with other devices, such as the vehicle or a nearby receiver. A buzzer is included to generate sound alerts in response to various events such as alcohol detection, vibration, or accident detection.

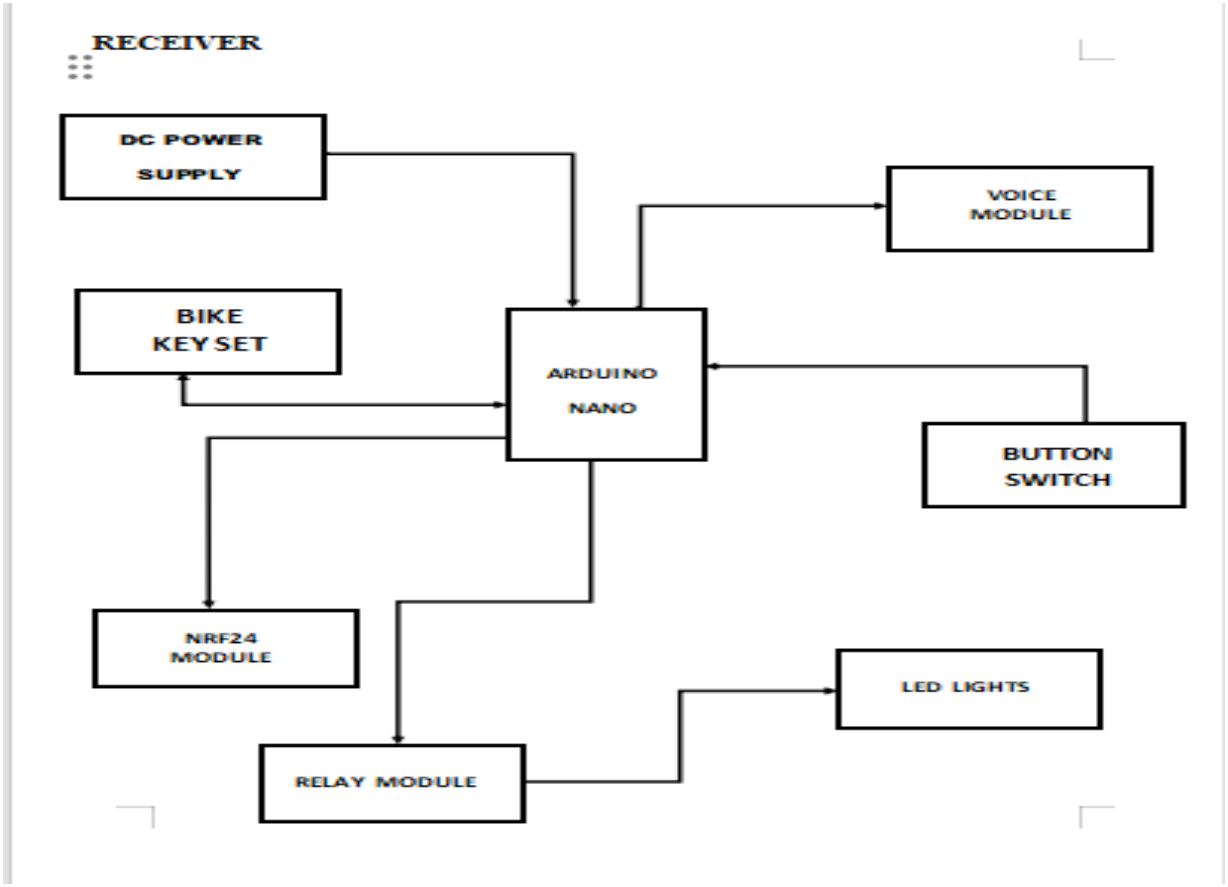
Additionally, LED lights are installed to provide visual alerts or to increase visibility in low-light conditions. All these components are interfaced with the Arduino Nano, which processes the sensor data and controls the output devices accordingly. This smart helmet design aims to significantly enhance rider safety by preventing drunk driving, ensuring real-time monitoring, enabling instant communication during emergencies, and providing both visual and audible alerts to reduce the risk of accidents.

Receiver

The Receiver module of the Smart Helmet system plays a critical role in ensuring operational control and safety response on the motorcycle side. At the heart of the setup is the Arduino Nano microcontroller, which acts as the control unit, managing inputs and outputs from various connected components. The system is powered by a DC power supply, which provides the necessary voltage to all connected modules. A bike key set is integrated to enable or disable the motorcycle's ignition based on data received from the transmitter module. Communication between the helmet and the bike is achieved using the NRF24 module, a wireless transceiver that receives signals from the transmitter (helmet) unit.

Upon receiving critical alerts like alcohol detection, crash, or helmet not worn, the Arduino Nano can activate a relay module to disable the ignition system, thereby preventing the bike from starting. A voice module is included to deliver audio alerts or messages to the rider, enhancing user interaction and awareness. The button switch allows for manual inputs or overrides, giving the rider control when necessary.

LED lights are also integrated to provide visual indicators, such as system status or alerts. Together, these components make the receiver unit an essential part of the smart helmet system, helping enforce safety protocols by wirelessly interacting with the helmet and controlling access to the motorcycle based on real-time sensor data.



Black Diagram: Receiver

The Receiver unit of the Smart Helmet system is a crucial component designed to interpret and respond to the signals transmitted by the helmet, ultimately ensuring the safety and control of the motorcycle. At the core of this unit is the Arduino Nano, a compact microcontroller that processes incoming data and coordinates the functions of various modules. The receiver is powered by a DC power supply, ensuring stable operation of all electronic components. One of the key features of this module is the bike key set, which is directly interfaced with the Arduino Nano. This setup allows the system to control the ignition of the motorcycle—effectively enabling or disabling the engine based on the rider's condition or helmet status. The NRF24 module is responsible for establishing wireless communication between the helmet (transmitter unit) and the motorcycle. It receives data such as whether the helmet is worn, alcohol is detected, or an accident has occurred. Based on this data, the Arduino can activate a relay module, which acts as a switch to either allow or cut off the ignition system.

Helmet with Device

This ensures that the bike cannot be started if unsafe conditions are detected, such as the rider being intoxicated or not wearing a helmet. To enhance user interaction, a voice module is integrated into the system to provide real-time audio feedback or safety instructions to the rider, thereby increasing awareness and encouraging compliance. Additionally, a button switch is connected to allow manual input or system override, offering flexibility in certain conditions.LED lights serve as visual indicators to represent the operational status of the system or to signal warnings. Overall, the receiver unit is designed to work in perfect harmony with the transmitter section of the Smart Helmet, making it a robust and intelligent safety solution that not only monitors the rider's condition but also directly controls the functionality of the motorcycle to prevent unsafe riding.

CONCLUSION

In conclusion, the development of a **Smart Helmet with GPS tracking capabilities** marks a transformative step toward enhancing rider safety, accountability, and emergency responsiveness in modern transportation. By integrating technologies such as GPS modules, microcontrollers, and wireless communication systems, this helmet does more than protect the head—it acts as an intelligent safety companion. In the event of an accident, the GPS tracking feature can instantly transmit the rider's location to emergency contacts or medical services, potentially saving precious time and lives. Moreover, the system can help in real-time tracking of vehicle routes, making it useful not only for individuals but also for fleet management and delivery services. Additional features like crash detection sensors, Bluetooth connectivity for hands-free communication, and even voice command support can further elevate its functionality. The smart helmet not only improves personal safety but also fosters responsible riding behavior, since the awareness of being monitored can discourage reckless actions. From a technological perspective, the project showcases how embedded systems, IoT, and sensor integration can be combined to create meaningful real-world solutions. While there may be challenges related to cost, power consumption, or GPS signal limitations inremote areas, the overall impact and potential of this innovation are immense. As technology continues to evolve, smart helmets with GPS tracking could become essential gear for motorcyclists, delivery riders, and even cyclists, contributing to a safer and more connected future in mobility.

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